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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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OPERATIONAL SUPPORT PLAN FOR THE REAL-TIME AUXILIARY COMPUTING FACILITY APOLLO 10 TRAJECTORY SUPPORT CHIEFS PROCEDURES HANDBOOK

Flight Analysis Branch

MISSION PLANNING AND ANALYSIS DIVISION

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

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PROJECT APOLLO

OPERATIONAL SUPPORT PLAN FOR THE REAL-TIME
AUXILIARY COMPUTING FACILITY APOLLO 10
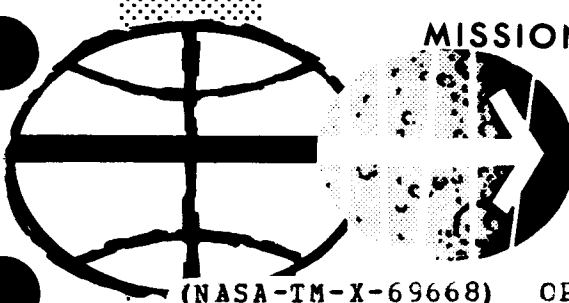TRAJECTORY SUPPORT CHIEFS PROCEDURES HANDBOOK

By Mission Support Section
Flight Analysis Branch

May 13, 1969

MISSION PLANNING AND ANALYSIS DIVISION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

Approved: _____
Charlie C. Allen, Chief
Flight Analysis Branch

Approved: _____
John P. Mayer, Chief
Mission Planning and Analysis Division

PREFACE

Information contained in this document represents the Trajectory Support Chiefs standard procedures for Apollo 10.

Any questions concerning this document should be directed to Charles E. Allday at extension 4401.

CONTENTS

NOMENCLATURE

ABDP	Apollo block data processor
ACQ	acquisition
ACR	auxiliary computer room
AGOP	Apollo generalized optics program
AGS	abort guidance system
AP	abort processor
ARIA	Apollo Range Instrumented Aircraft
ATP	alternate target point
ARMACR	RTACF Apollo reference mission program
ARRS	Apollo real-time rendezvous support program
ARS	Apollo reentry simulation processor
ASC	ascent stage
BTU	British thermal unit
CAD	Computation and Analysis Division
CCATS	command, communication, and telementry systems
C_D	coefficient of drag
CG	center of gravity
CLA	contingency landing area
CM	command module
COM	communications
CRYO	cryogenics
CSM	command and service modules

CUR	current
DAP	digital autopilot
DMT	detailed maneuver table
DOI	descent orbit injection
DPS	descent propulsion system
ECI	earth-centered inertial
ECS	environmental control system
EDS	emergency detection system
EECOM	electrical, environmental communications
EI	entry interface
EMU	extravehicular mobility unit
EPS	electrical power system
ER	earth radii
ER/HR	earth radii per hour
EVA	extravehicular activity
FCD	Flight Control Division
FCOB	Flight Control Operations Branch
FD	flight director
FDAI	flight director attitude indicator
FDO	flight dynamics officer
fps	feet per second
GAP	Gafford's abort program
GEMMV	General Electric missile and satellite simulation - multivehicle version
GET	ground elapsed time

GETI	ground elapsed time of ignition
GIMANG	gimbal angle processor
GMT	Greenwich mean time
GMTGRR	Greenwich mean time of guidance reference release
GMTZS	Greenwich mean time of zeroing spacecraft
GNC	guidance navigation and control
GOST	guidance optics support table
GOX	gaseous oxygen
H_a	altitude of apogee
H_p	altitude of perigee
ID	identification
IMU	inertial measurement unit
IU	instrumentation unit
KM	kilometers
KSC	Kennedy Space Center
LAT	latitude
L/D	lift-to-drag ratio
LDP	LM descent planning
LEC	Lockheed Electronics Company
LLS	lunar landing site
LM	**lunar module**
L/O	lift-off
LOI	lunar orbit insertion
LOIPD	lunar orbit insertion planning display

LONG	longitude
LOS	line of sight/loss of signal
LOST	LM optics support table
LOX	liquid oxygen
LPD	landing point designator
LSAD	lunar surface alinement display
LVLH	local vertical-local horizontal coordinate system
MCC	midcourse correction
MCI	moon-centered inertial
MEI	meteorological
MPAD	Mission Planning and Analysis Division
MPT	mission plan table
MRS	mass properties, RCS, SPS program
MSC	Manned Spacecraft Center
m/sec	meters per second
MSK	manual selection keyboards
NAV	navigation
NMBY	nearest mean Bessilian year
NORAD	North American Air Defense Command
OST	optics support table
PFAO	Post Flight Analysis Office
PLA	primary landing area
PLSS	portable life support system
PSAT	predicted site acquisition table

PVT	pressure-volume-temperature
PWR	power
RCS	reaction control system
REFSMMAT	reference to stable member matrix
RETRO	retrofire officer
REV	revolution
RTACF	Real-Time Auxiliary Computing Facility
RTCC	Real-Time Computer Complex
RTE	return to earth
S/C	spacecraft
SEENA	spacecraft electrical energy network analysis
SHe	super-critical helium
SLA	spacecraft/lunar module adapter
SLV	Saturn launch vehicle
SM RCS	service module reaction control system
SODB	Spacecraft Operational Data Book
SPAN	Solar Particle Alert Network
SPD	Space Physics Division
SPS	service propulsion system
SSR	staff support room
SST	star sighting table
TEC	transearth coast
TEI	transearth injection
TLC	translunar coast

TLI   translunar injection

TM   telemetry

TRAJ   trajectory support chief

WX FCST weather forecast

PART I: AGOP

P-23 Star-Horizon Sightings

Lunar Surface Alignment Display

MISSION ___Apollo 10_____   DATE ___April 7, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
P-23 Star Horizon Sightings	Hector Garcia, Jr.
	PROGRAM (S) USED: ARMACR/Work Schedule

REQUEST FROM:	DATA PASSED TO:
Flight Plan Support	Flight Plan Support

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. AGOP Option 1, Mode 2. Vector, REFSMMAT 3. Begin and End time, Increment 4. Star ID, Horizon (Earth or Moon) 5. Maneuver information if needed (Input sheet from requestor)	**COMPARISONS:** Requestor will verify output data. **INCLUSIONS:** Program inputs 1, 2, 3, 5 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

RTACF REQUIREMENT NOTES

MISSION _____ Apollo 10 _____   DATE _____ April 18, 1969 _____

REQUIREMENT: Lunar Surface Alignment Display (LSAD)	RESPONSIBLE RTACF PERSONNEL: Hector Garcia, Jr.
	PROGRAM (S) USED: ARMACR/AGOP

REQUEST FROM: GUIDANCE OFFICER	DATA PASSED TO: GUIDANCE OFFICER

PROGRAM INPUTS:
 	
  1. AGOP Option, Mode
  2. Vector, REFSMMAT
  3. Gimbal angles or Instrument
      angles
  4. LM GETLO from Lunar Surface
  5. Star ID
 	
(Input Sheet)
	SSR CONSOLE LOG:
	COMPARISONS:
	
	Compare with REFSMMAT from Guidance.
	
	INCLUSIONS:
	
	Include inputs: 1, 2, 3, 4
	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

    RTCC will not have this display for F. Guidance Officer interested in
computation of a LM L.O. REFSMMAT during lunar orbit.

PART II: ALIGNMENT

Antenna Pointing

OST (GOST, LOST)

SST

LM Burn Horizon Check

CSM IMU Alignment Check

Spacecraft Areal Pointing

Sun Look Angles

Docking Alignment

MISSION __Apollo 10_____   DATE ___April 1, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
ANTENNA POINTING a. CSM Deep Space ANTENNA b. LM S-BAND STEERABLE ANTENNA	Hector Garcia, Jr.
	PROGRAM (S) USED: ARMACR/AGOP

REQUEST FROM:	DATA PASSED TO:

Flight Plan Support
    or
LM COMM
	Flight Plan Support SSR CONF LOOP
	    or
	LM COMM SSR CONF LOOP

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. AGOP (option 4) 2. Mode (Antenna fixed or movable) 3. Vector, REFSMMAT 4. Gimbal angles or antenna angles 5. Start time, end time, time increment 6. Target 7. Maneuver information if needed (Input sheet)	Requestor will verify output data. INCLUSIONS: Program inputs 1, 2, 3 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:
Requestor will submit completed input sheet and verify output. Trajectory Support Chief will verify any included maneuvers with FDO.

MISSION ___Apollo 10_____   DATE ___April 3, 1969____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
OST (Optics Support Table) GOST (CSM OST) MSK 229 LOST (LM OST) MSK 239	Hector Garcia, Jr.

	PROGRAM (S) USED:
	ARMACR/AGOP

REQUEST FROM:	DATA PASSED TO:
Guidance Officer	Guidance Officer SSR FLT DYN 1

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:

1. AGOP (OPTION 7)
2. Vector weight REFSMMAT
3. Vehicle, instrument
4. Option, Mode
5. Gimbal angles or Instrument Angles
6. Start time, End Time, Increment
7. Maneuver Information if needed
	Compare GOST (MSK 229) or
	         LOST (MSK 239)
	
	INCLUSIONS:
	
	    Program inputs 1, 2, 4
	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:
Trajectory will fill out input sheet. Hardcopy MSK 229 (GOST) and/or MSK 239 (LOST). RTCC has no ACQ and LOSS Computations on GOST and LOST. LM instruments can be pointed with CSM Data and vise versa.

RTACF REQUIREMENT NOTES

MISSION _____ Apollo 10 _____   DATE __April 4, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
SST (Star Sighting Table) CM SST MSK 53	Hector Garcia, Jr.

PROGRAM (S) USED:

ARMACR/AGOP

REQUEST FROM:	DATA PASSED TO:
Flight Plan Support	Flight Plan Support SSR CONF LOOP

PROGRAM INPUTS:

1. AGOP Option 8, Mode
2. Instrument
3. Gimbal angles or instrument angles
4. Vector, weight, REFSMMAT
5. Vehicle
6. G.E.T. Start and Stop
7. Time increment

(Input sheet from requestor)

SSR CONSOLE LOG:
COMPARISONS:

CM SST (MSK 53)

INCLUSIONS:

Program inputs 1, 4, 6

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

RTACF REQUIREMENT NOTES

MISSION __Apollo 10__   DATE __April 4, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
LM Burn Horizon Check Lost MSK 239	Hector Garcia, Jr.

	PROGRAM (S) USED: ARMACR/AGOP

REQUEST FROM:	DATA PASSED TO:
Guidance Officer	Guidance Officer

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. AGOP/Option 7, Mode 1 2. Inner and middle gimbal angles 3. Vector, REFSMMAT 4. Time of check (G.E.T.)	Compare LOST (MSK 239) INCLUSIONS: 1. Program inputs 1, 2, 3, 4
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Computes outer gimbal angle to place +Z axis in the x axis-radius vector plane. The LPD (Landing Point Designator) angle is defined as the angle between the +Z axis and the LOS to the horizon.

MISSION _____ Apollo 10 _____   DATE __April 9, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
CSM IMU alignment horizon check	Larry D. Davis
	PROGRAM (S) USED:
	ARMACR

REQUEST FROM:	DATA PASSED TO:
Guidance Officer	Guidance Officer

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Vector 2. G.E.T. of computation 3. REFSMMAT 4. Forward or AFT horizon 5. Heads up or heads down 6. Reference oblate earth or spherical moon	
	INCLUSIONS: 1. All program inputs 2. Output gimbal angles
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Output gimbal angles to align "horizon hatch mark $31.7°$" on the horizon for evaluating IMU alignment.

MISSION ___ Apollo 10 ___   DATE __ April 9, 1969 __

REQUIREMENT: Spacecraft Areal Pointing (POTS)	RESPONSIBLE RTACF PERSONNEL: Charles Allday
	PROGRAM (S) USED: Monitor System Option 07

REQUEST FROM:

Guidance Officer

DATA PASSED TO:

Guidance Officer

PROGRAM INPUTS:

1. Vehicle
2. REFSMMAT
3. Pitch and yaw angles in body system
4. RT. ascension of sun
5. Declination of sun

SSR CONSOLE LOG:
COMPARISONS:

INCLUSIONS:

1. Program inputs 1, 2, 3
2. Output gimbal angles

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

RT. ascension and declination of sun are for day of computation. Processor is used to determine the CSM attitude so the liquid waste dump nozzle, the electrical power system radiator, and the environmental control system radiators receive optimum heating from the sun.

Processor does not compute FDAI angles.

MISSION __Apollo 10_____   DATE __April 25, 1969_____

REQUIREMENT: Sun Look Angles	RESPONSIBLE RTACF PERSONNEL: Larry D. Davis
	PROGRAM (S) USED: ARMACR

REQUEST FROM: RETRO, Flight Plan Support	DATA PASSED TO: RETRO Flight Plan Support - SSR CONF LOOP

PROGRAM INPUTS: 1. G.E.T. computation 2. Vector 3. REFSMMAT 4. Gimbal angles	SSR CONSOLE LOG: COMPARISONS: INCLUSIONS: 1. Program inputs 1, 2, 3, 4 2. Sun look angles INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Data is to be generated at the ignition time of each maneuver.

RTACF REQUIREMENT NOTES

MISSION _____ Apollo 10 _____   DATE ___ April 9, 1969 _____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Docking Alignment	Stan D. Holzaepfel

PROGRAM (S) USED:

ARMACR

REQUEST FROM:	DATA PASSED TO:
GUIDANCE OFFICER	GUIDANCE OFFICER

PROGRAM INPUTS:

1. Docking angle.
2. Three of the following:
   - (a) CSM REFSMMAT
   - (b) LM REFSMMAT
   - (c) CSM gimbal angles
   - (d) LM gimbal angles

(Output will be the fourth group of quantities.)

SSR CONSOLE LOG:

COMPARISONS:

INCLUSIONS:

1. Program inputs 1, 2
2. Output REFSMMAT or gimbal angles

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

CSM or LM gimbals could be given in FDAI angles. CSM gimbals and CSM FDAI are the same, LM FDAI angles are body attitudes:

	CSM		LM	
	GIMBALS	FDAI	GIMBALS	FDAI
P	I	I	I	P_B
Y	M	M	O	Y_B
R	O	O	M	R_B

PART III: ANTENNA-THERMAL

Antenna Test Data

RTACF REQUIREMENT NOTES

MISSION __Apollo 10__   DATE ___April 18, 1969___

REQUIREMENT: Antenna Test Data	RESPONSIBLE RTACF PERSONNEL: Larry D. Davis
	PROGRAM (S) USED: 1. ARM 2. Special post processor which generates tape
REQUEST FROM: 1. AS noted in work schedule 2. Special request or if mission profiles change	DATA PASSED TO: 1. Antenna evaluation team, call 5566 when tape is ready 2. CAD group, call 5457 when tape is ready

PROGRAM INPUTS:

1. State vector
2. Begin and end G.E.T.
   (Nominally ΔT = 14 hours)
3. Delta time between data points
   (Nominally ΔT = 1 minute)
4. Maneuver definition if any
   (optional) provide P-30's and T_{IG}
   from planned DMT (MSK 54 or 69)

SSR CONSOLE LOG:
COMPARISONS:

INCLUSIONS:

1. Program inputs 1, 2, 4

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

1. Note that two copies of same tape are required.
2. Data is generated once each 12 hours for a time period (ΔT) of 14 hours
   (to provide overlap) from TLI to splash.

PART IV: CONVERSIONS

State Vector Coordinate Transformation

Alpha Numeric Restart Vector

Gimbal Angle Conversion (REFSMMAT to REFSMMAT)

Gimbal Angle to FDAI

Gimbal Angle Conversion (GIMANG)

S-IVB NAV Update

AGS NAV Update

CSM/LM NAV Update

L/O REFSMMAT

Command Load Conversions

MISSION __Apollo 10__   DATE __April 9, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
State Vector Coordinate Transformation	Stan Holzaepfel

	PROGRAM (S) USED:
	Monitor System Option 10

REQUEST FROM:	DATA PASSED TO:
FDO, RETRO	FDO, RETRO, DYNAMICS

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:

1. Vector (X, Y, Z, $\dot{X}$, $\dot{Y}$, $\dot{Z}$)
  a. Stable Member (KM & M/sec)
  b. NMBY (ECI, MCI)
2. REFSMMAT (for Stable Member Vector Only
	Record: REFSMMAT used, vector output

	INCLUSIONS: 1. Program inputs 1, 2
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Normal output is state vector in RTCC Coordinate system: NMBY (ECI or MCI)

The capability exists to convert from stable member to NMBY or vice-versa.

MISSION ___Apollo 10___   DATE ___April 9, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
ALPHA Numeric Restart Vector	Charles E. Allday
	PROGRAM (S) USED:
	Monitor System Option 03

REQUEST FROM:	DATA PASSED TO:
RETRO	RETRO, DYNAMICS

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Vector in CCATS format	
	INCLUSIONS:
	1. Copy of CCATS vector.
	2. Copy of output vector.
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Output RTCC restart vector is in Greenwich system.

See detailed notes for example.

MISSION _____Apollo 10_____   DATE __April 4, 1969__

REQUIREMENT: Gimbal Angle Conversion (Formerly REFSMMAT to REFSMMAT Conversion)	RESPONSIBLE RTACF PERSONNEL: Bernie Schneider
	PROGRAM (S) USED: ARMACR/REPORT-GENERATOR, AGOP

REQUEST FROM: GUIDANCE OFFICER	DATA PASSED TO: GUIDANCE OFFICER

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. REFSMMAT 1 2. Gimbal angles 1 3. REFSMMAT 2 4. Vehicle CSM or LM	COMPARISONS: Compare gimbal angles 2 for REFSMMAT 2 based on the inertial attitude from gimbal angles 1 and REFSMMAT 1. INCLUSIONS: 1. Program inputs 1, 2, 3 2. Gimbal angles 2 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:
    Program inputs are for one vehicle.

    The operation of the processor is not restricted to the above inputs. Any space-
    craft alignment option available in the ARMACR program may be used instead of
    REFSMMAT 1 and gimbal angles 1 to establish some fixed attitude in space. In any
    case, a set of gimbal angles (gimbal angles 2) will be output when REFSMMAT 2 is
    input.

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10_____   DATE ___April 4, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
LM gimbal angles to LM FDAI LM FDAI to LM gimbal angles	Stan Holzaepfel

	PROGRAM (S) USED:
	Monitor System Option 8

REQUEST FROM:	DATA PASSED TO:
Guidance Officer	Guidance Officer

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. GIMBALS (O, I, M) or 2. FDAI (P, Y, R)	Record input and output INCLUSIONS: 1. LM gimbal angles 2. LM FDAI angles INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

FDAI angles are body attitudes and are designated P, Y, R.
FDAI angles may be found on the Detailed Maneuver Table.

MISSION _____ Apollo 10 _____   DATE _____ April 9, 1969 _____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Gimbal Angle Conversion (GIMANG Processor)	Stan D. Holzaepfel

	PROGRAM (S) USED:
	Monitor System Option 09

REQUEST FROM:	DATA PASSED TO:
GUIDANCE OFFICER	GUIDANCE OFFICER

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Gimbal angles for IU, LM, and CSM at liftoff. 2. One set of gimbals for the following: (a) CSM (b) LM (c) IU	
	INCLUSIONS: 1. Program input 2. 2. Two sets of output gimbals.
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Three sets of gimbals at liftoff establish a matrix where at any time later knowing one set, the other two sets can be computed. With this and the docking alignment requirement, all data needed can be furnished.

Output gimbal angles are only valid for docked configurations.

The three sets of liftoff gimbal angles are obtained from the Guidance Officer.

MISSION _____ Apollo 10 _____   DATE __ April 7, 1969 __

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
S-IVB Navigation Update SLV NAV Update (MSK 235)	Stan D. Holzaepfel
	PROGRAM (S) USED: ARMACR

REQUEST FROM:	DATA PASSED TO:
GUIDANCE OFFICER	GUIDANCE OFFICER

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. Vector 2. GMTGRR of booster (IU) 3. Launch azimuth 4. GET update	**COMPARISONS:** Compare NAV update to RTCC display SLV NAV update (MSK 235) **INCLUSIONS:** 1. Program inputs 1, 2, 3, 4 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10___   DATE ___April 7, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
AGS Navigation Update (CSM & LM) AGS NAV Updates (MSK 277)	Stan D. Holzaepfel
	PROGRAM (S) USED: ARMACR

REQUEST FROM:	DATA PASSED TO:
GUIDANCE OFFICER	GUIDANCE OFFICER

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. Vector 2. GET update 3. GET "K" (a ΔT bias) 4. REFSMMAT	**COMPARISONS:** Compare NAV update to RTCC display AGS NAV updates (MSK 277) **INCLUSIONS:** 1. Program inputs 1, 2, 3 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Output is vector in decimal ft and ft/sec. Time is reflected in tenths of minutes.

A REFSMMAT is needed because an AGS vector is in the Stable Member System.

MISSION ____Apollo 10_____   DATE __April 4, 1969____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Navigation Update (CSM & LM) CSM NAV Update to CMC (MSK 276) LGC LM NAV Update (MSK 279)	Stan D. Holzaepfel
	PROGRAM (S) USED: ARMACR

REQUEST FROM: GUIDANCE OFFICER	DATA PASSED TO: GUIDANCE OFFICER
PROGRAM INPUTS: 1. GET Update 2. Vector 3. GMTZS	**SSR CONSOLE LOG:** COMPARISONS: Compare output to RTCC displays CSM NAV update to CMC (MSK 276) LGC LM NAV update (MSK 279) INCLUSIONS: 1. Program inputs 1, 2 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

MISSION _____Apollo 10_____   DATE _____April 3, 1969_____

REQUIREMENT: L. O. REFSMMAT GOST MSK 229	RESPONSIBLE RTACF PERSONNEL: Hector Garica, Jr.
	PROGRAM (S) USED: ARMACR

REQUEST FROM: GUIDANCE OFFICER	DATA PASSED TO: GUIDANCE OFFICER

PROGRAM INPUTS: 1. G.M.T.Z.S. (G.M.T. of zeroing spacecraft) 2. Launch Azimuth	SSR CONSOLE LOG: COMPARISONS: Compare GOST (MSK 229) INCLUSIONS: 1. Program Inputs 1, 2 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Both RTCC and onboard computer compute L. O. REFSMMAT. One of these will become "CUR."

MISSION __Apollo 10__   DATE __April 9, 1969__

REQUIREMENT: Command Load Conversions	RESPONSIBLE RTACF PERSONNEL: Ted L. Turner
	PROGRAM (S) USED: Monitor System Option 03

REQUEST FROM: Guidance Officer	DATA PASSED TO: Guidance Officer

PROGRAM INPUTS: 1. Command Load Option 2. Decimal or Octal Conversion 3. Input data For General Conversion Only 4. Scale Factor 5. Precision 6. Multiplier or Divisor	SSR CONSOLE LOG: COMPARISONS: Compare data to appropriate RTCC display. INCLUSIONS: 1. Program inputs 1, 2 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Command Load OPTIONS:

1. Nav Update
2. Ext. ΔV (Orbit)
3. Ext. ΔV (deorbit)
4. REFSMMAT
5. RTCC Restart (numeric)
6. RTCC Restart (Alphanumeric)
7. General Conversion

PART V: GROUNDTRACKS

Earth Orbit Groundtracks

Lunar Orbit Groundtracks

Entry Groundtracks

MISSION ___Apollo 10_____   DATE __April 10, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Groundtracks (Earth Orbit) Groundtrack Digitals (MSK 347)	Larry D. Davis
	PROGRAM (S) USED:
	ARMACR/Report Generator

REQUEST FROM:	DATA PASSED TO:
Work Schedule RECOVERY	RECOVERY - Recovery Display Loop

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Vector 2. G.E.T. Begin, End Computation or Revolutions 3. Maneuver information 4. Δt Print 60 sec. 5. Launch azimuth	INCLUSIONS: 1. Program inputs 1, 2, 3
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Recovery requires earth orbit groundtracks at L.O. - 3 hours for first ten revs. using the predicted launch azimuth and assuming no TLI burn. These should be updated as soon as possible after launch for revs. 3 through 10.

MISSION _____ Apollo 10 _____   DATE _____ April 18, 1969 _____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
LUNAR MAPPING SCIENCE LABORATORY (COMPUTE GROUNDTRACKS FOR CSM DURING LUNAR ORBIT PHASE)	Larry D. Davis
	PROGRAM (S) USED: ARMACR

REQUEST FROM:	DATA PASSED TO:
LUNAR MAPPING SCIENCE LAB Work Schedule	Call 6126 when data is ready

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. RTCC vector 2. GET of start and stop (ΔT is normally 14 hours) 3. ΔT step size (ΔT = 1 min) 4. Maneuver to be included P-30's and T_{IG} from DMT (MSK 54 or 69)	INCLUSIONS: Program inputs 1, 2, 3
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

1. This data will be computed each 12 hours for a 14 hour interval.

2. The data will be computed pre-LOI assuming planned LOI-1 and LOI-2.

MISSION ___ Apollo 10 _____   DATE ____ April 10, 1969 _____

REQUIREMENT:
 	
   Groundtracks (Entry)
   Groundtrack Digitals (MSK 347)
	RESPONSIBLE
	RTACF PERSONNEL:

	PROGRAM (S) USED: ARMACR/Report Generator

REQUEST FROM:
 	
   Work Schedule
   RECOVERY
	DATA PASSED TO:
	
	RECOVERY - Recovery Display Loop

PROGRAM INPUTS:
 	
  1. Vector
  2. G.E.T. Begin, End Computation
  3. Entry lift
  4. Δt print 20 sec.
	SSR CONSOLE LOG:
	COMPARISONS:
	
	INCLUSIONS:
	
	   Program inputs 1, 3
	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

   Recovery requires entry groundtracks (400K to Splash) at E. I. - 15 hours, after nominal MCC6.

   Groundtracks for a simulated skipout are also required.

   Data for begin blackout, end blackout, drogue deploy and main deploy should be included.

PART VI: LUNAR ORBIT INSERTION

LOI-1

LOI-2

LOI Monitor

LOI Crew Charts

LM Descent Planning

RTACF REQUIREMENT NOTES

MISSION __Apollo 10__   DATE ___April 1, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:

LOI 1 Calculations
 	
LUNAR ORBIT INSERTION PLANNING DISPLAY
      (LOIPD) MSK 78
MISSION PLAN TABLE (MPT) MSK 47
FDO DETAILED MANEUVER TABLE (DMT1) MSK 54
                       (DMT2) MSK 69
	L. D. Davis

	PROGRAM (S) USED: LOI, ARRS

REQUEST FROM:	DATA PASSED TO:
FDO	FDO LOI

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. Vector, REFSMMAT, Thruster specifications 2. Δt of first pass (LOI1 - site pass) 3. Apolune Altitude 4. Perilune Altitude 5. Circular Altitude 6. MAX. LOI ΔV 7. LAT., LON., Radius of Lunar Landing Site (LLS) 8. MIN., Desired, MAX. LLS Azimuth 9. KGW (solution of LOIPD for MPT and DMT) 10. MPT information 11. Additional constants	**COMPARISONS:** Compare impulsive solutions of LOIPD for one which best satisfies constraints. Compare finite burn quantities of DMT. **INCLUSIONS:** 1. Solution passed to MPT 2. External ΔV targets 3. GET LOI1 Maneuver 4. State vector 5. REFSMMAT INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Point of Contact: Robert F. Wiley, Lunar Mission Analysis Branch
The LOIPD is generated by the LOI processor and one solution (KGW) is passed to ARRS for the MPT and DMT.
Additional constants will be generated by a midcourse processor computer run after lift-off and will remain constant on data bank.
See detailed notes for explanation of ten solutions in LOIPD.

MISSION ___Apollo 10_____   DATE ___April 1, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
LOI 2 CALCULATIONS FDO DETAILED MANEUVER TABLE (DMT1) MSK 54 (DMT2) MSK 69 LM DESCENT PLANNING TABLE (LDP) MSK 86 FDO MISSION PLAN TABLE (MPT) MSK 47	L. D. Davis

	PROGRAM (S) USED:
	ARRS (LDP Mode 2, sequence 1)

REQUEST FROM:	DATA PASSED TO:
FDO	FDO

PROGRAM INPUTS:
1. Vector, REFSMMAT, Thruster specification
2. LDP (CIR)
3. Mode 2, Sequence 1
4. Threshold GET
5. Circularization Altitude (respect LLS)

SSR CONSOLE LOG:

COMPARISONS:

Compare finite burn quantities of DMT

INCLUSIONS:
1. State vector
2. REFSMMAT
3. External ΔV targets
4. GET LOI 2 maneuver

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS: Two impulse (LOI-2, DOI) must be computed.
Nominal DOI must be included:
RADLS - Radius of Lunar Landing Site - 937.675
LONGLS - Longitude Lunar Landing Site - 2.632
LATLS - Latitude Lunar Landing Site - 34.025
LATPD - Latitude of powered descent - 50000.
PFARC - powered flight arc - 15.1
PFTIM - powered flight time (PDI-Landing) - 680.
Threshold DOI - 99:30:00

See detailed notes for input sheet.

MISSION ___Apollo 10_____   DATE __April 1, 1969_____

REQUIREMENT: LOI MONITOR	RESPONSIBLE RTACF PERSONNEL: L. D. Davis
	PROGRAM (S) USED: ARMACR

REQUEST FROM:
 	
   FDO
	DATA PASSED TO:
	
	   FDO
	   LOI

PROGRAM INPUTS:
 	
  1. Vector, REFSMMAT
  2. GET$_L$ MANEUVER (finite) from DMT
  3. $X_\Delta V$ P30's (finite) from DMT
  4. Heads up/down
	SSR CONSOLE LOG:
	COMPARISONS:
	
	  Compare: Hp for nominal
	              Hp for +10 deg pitch error
	              Hp for -10 deg pitch error
	
	INCLUSIONS:
	
	  Program inputs 1, 2, 3, 4
	  and the three Hp solutions
	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

   The nominal LOI$_1$ P30's are used to define an ignition attitude to which a constant
pitch rate error is applied to obtain a max. $\pm$ 10 deg pitch error at cutoff.

MISSION ___Apollo 10_____   DATE ___April 1, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
LOI CREW CHARTS	Larry D. Davis
	PROGRAM (S) USED:
	ARMACR

REQUEST FROM:	DATA PASSED TO:
FDO	FDO Abort Support

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Vector, REFSMMAT 2. GETI LOI 1 from DMT 3. X ΔVP30's LOI 1 from DMT 4. Inertial attitude for 15 minute abort (function of day of launch, obtained from Abort Support).	Compare gimbal angles and abort ΔV with nominal crew charts
	INCLUSIONS:
	Program inputs 1, 2, 3, 4
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

MISSION __Apollo 10_____   DATE ___April 1, 1969____

REQUIREMENT:
 	
   IM DESCENT PLANNING
 	
   IM DESCENT PLANNING TABLE (LDP) MSK 86
   FDO DETAILED MANEUVER TABLE (DMT1) MSK 54
                         (DMT2) MSK 69
   FDO MISSION PLAN TABLE (MPT) MSK 47
	RESPONSIBLE
	RTACF PERSONNEL:
	
	L. D. Davis

	PROGRAM (S) USED: ARRS (LDP)

REQUEST FROM:
 	
  FDO
	DATA PASSED TO:
	
	  FDO

PROGRAM INPUTS:
  1. Vector, REFSMMAT, Thruster
      specifications
  2. Specifications for Orbital Adjust-
      ment Maneuvers if any (possibly LOI2)
  3. Specifications for Descent Orbit
      Injection Maneuver (DOI)
  4. MPT information if desired
 	
Inputs for LDP are impulsive.
 	
(INPUT SHEET)
	SSR CONSOLE LOG:
	COMPARISONS:
	
	Compare impulsive burn quantities of LDP.
	Compare finite burn quantities of DMT's.
	
	INCLUSIONS:
	
	  1. State vector
	  2. REFSMMAT
	  3. External ΔV targets
	  4. Ignition times (GET)
	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

   ORBITAL ADJUSTMENT MANEUVER MODES
   1. (PCC) Plane change and Circularization.
   2. (ASH) Apside Shift and Altitude Adjustment for Descent.
   3. (RTN) Return Lunar Orbit to Nominal.
   4. (CIR) Circularize the Lunar Orbit at a Specified Input Altitude.
   5. (DHP) Dual Hohmann Transfer and Plane Change.
   6. (FCP) Free Azimuth Circularization and Plane Change.

PART VII: MASS PROPERTIES

Dry Command Module

Dry Service Module

Dry Ascent Stage

Dry Descent Stage

C.G. Tables and DAP Loads

Aerodynamics

Hybrid Aerodynamics

Docked Trim Angles

MISSION __Apollo 10__   DATE __April 2, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
MASS PROPERTIES Dry Command Module	Ted L. Turner
	PROGRAM (S) USED: Mass Properties, Option 002

REQUEST FROM:	DATA PASSED TO: Insert in SSR mass properties console log.

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. CM at earth launch - SODB, Vol. III 2. Dock. mech. (delete) - SODB, Vol. III 3. Potable water (delete) earth launch - SODB, Vol. III 4. Waste water (delete) earth launch - SODB, Vol. III	Compare dry module to dry module of previous amendment INCLUSIONS: 1. Reference amendment to SODB 2. Dry Weight, $X_{c.g.}$, $Y_{c.g.}$, $Z_{c.g.}$ INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

The Trajectory Support Chief should verify the Dry Module with LM Propulsion on SSR CONF LOOP or CSM GNC.

MISSION ___ Apollo 10 ___   DATE __ April 2, 1969 __

REQUIREMENT: MASS PROPERTIES Dry Service Module	RESPONSIBLE RTACF PERSONNEL: Ted L. Turner
	PROGRAM (S) USED: Mass Properties, Option 002

REQUEST FROM:	DATA PASSED TO: Insert in SSR mass properties console log.

PROGRAM INPUTS:
  1. SM at earth launch - SODB, Vol. III
  2. SLA ring - SODB, Vol. III
  3. Loaded SM RCS (delete) - SODB,
      Vol. III
  4. Usable cryogenics (delete) - SODB,
      Vol. III
	SSR CONSOLE LOG:
	COMPARISONS:
	Compare dry module to dry module of previous amendment.
	
	INCLUSIONS:
	1. Reference amendment to SODB.
	2. Dry Weight, $X_{c.g.}$, $Y_{c.g.}$, $Z_{c.g.}$
	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

   SM RCS and cryogenics which are trapped outside of tanks will remain in dry module.

   The Trajectory Support Chief should verify the Dry Module with CSM Propulsion on SSR CONF LOOP or CSM GNC.

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10_____   DATE __April 2, 1969____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
MASS PROPERTIES Dry Ascent Stage	Ted L. Turner
	PROGRAM (S) USED: Mass Properties, Option 002

REQUEST FROM:	DATA PASSED TO: Insert in SSR mass properties console log

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. Ascent stage earth launch - SODB, Vol. III 2. GOX 1 (delete) loaded - SODB, Vol. III 3. GOX 2 (delete) loaded - SODB, Vol. III 4. Water 1 (delete) loaded - SODB, Vol. III 5. Water 2 (delete) loaded - SODB, Vol. III 6. LM RCS (delete) trapped outside tanks - SODB, Vol. III	**COMPARISONS:** Compare dry module to dry module of previous amendment **INCLUSIONS:** 1. Reference amendment to SODB 2. Dry Weight, $X_{c.g.}$, $Y_{c.g.}$, $Z_{c.g.}$ INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

The LM RCS (trapped outside tanks) was deleted from the dry module because the RCS quads on the LM weight summary (MSK 1007) will include usable, trapped inside tanks, and trapped outside tanks for APOLLO 10.

The RTACF Dry Ascent Stage and the Dry Ascent Stage on the LM weight summary should be the same for APOLLO 10.

The Trajectory Support Chief should verify Dry Module with LM Propulsion on SSR CONF LOOP.

MISSION __Apollo 10__   DATE __April 2, 1969__

REQUIREMENT: MASS PROPERTIES Dry Descent Stage	RESPONSIBLE RTACF PERSONNEL: Ted L. Turner
	PROGRAM (S) USED: Mass Properties, Option 002

REQUEST FROM: Work Schedule	DATA PASSED TO: Insert in SSR mass properties console log

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. Descent stage earth launch - SODB, Vol. III 2. GOX (delete) loaded - SODB, Vol. III 3. Water (delete) loaded - SODB, Vol. III	COMPARISONS: Compare dry module to dry module of previous amendment INCLUSIONS: 1. Reference amendment to SODB 2. DRY Weight, $X_{c.g.}$, $Y_{c.g.}$, $Z_{c.g.}$ INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

The Trajectory Support Chief should verify the Dry Module with LM Propulsion on
SSR CONF LOOP.

MISSION _____ Apollo 10 _____   DATE ___ April 2, 1969 _____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
MASS PROPERTIES Weight vs Center of Gravity Tables Dap Load	Ted L. Turner
	PROGRAM (S) USED: Mass Properties, Options 003 or 004

REQUEST FROM:	DATA PASSED TO:
RETRO LM Propulsion	RETRO LM Propulsion - SSR CONF LOOP

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. DRY Modules - SSR mass properties console log 2. Propellants and expendables from CSM MSK 894, LM MSK 1007 3. Miscellaneous items	Compare trim angles on DMT or Deorbit Ext. ΔV display MSK 329 INCLUSIONS: 1. Weight 2. RTCC Trim angles 3. RTACF Trim angles INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

C.G. Tables may be generated for five spacecraft configurations.
DAP loads may be generated for CSM alone or docked and LM alone or docked.
Mixture ratios should be 1.6 until changed in real time.
DPS thrust should be 4257 for LM DAP LOADS.

MISSION ___Apollo 10___   DATE ___April 2, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
MASS PROPERTIES Aerodynamics	Ted L. Turner
	PROGRAM (S) USED: Mass Properties, Option 002

REQUEST FROM:	DATA PASSED TO:
RETRO	RETRO Reentry Support - Reentry Support Loop

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. CM Dry - SSR Mass Properties console log 2. Potable water - MSK 894 for weight, SODB, Vol. III for c.g. 3. Waste water - MSK 894 for weight, SODB, Vol. III for c.g. 4. CM RCS Prop. used prior to 400K feet - SODB, Vol. III 5. Miscellaneous items	**COMPARISONS:** Compare L/D with aerodynamic display, MSK 1620 **INCLUSIONS:** 1. Program Inputs 2, 3, 4, 5 2. New L/D INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Pass ΔX, ΔY, and ΔZ to Reentry Support
$\Delta X = X_{c.g.} - 1141.25$
$\Delta Y = Y_{c.g.}$
$\Delta Z = Z_{c.g.}$

MISSION ____Apollo 10____   DATE __April 15, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
MASS PROPERTIES Hybrid Aerodynamics	Ted L. Turner, Jr.
	PROGRAM (S) USED: Mass Properties Option 002

REQUEST FROM:	DATA PASSED TO:
RETRO Work Schedule	RETRO, REENTRY SUPPORT REENTRY SUPPORT LOOP

PROGRAM INPUTS:
1. (+) CM DRY (Mass Prop Console log
2. (+) Potable water (MSK 894)
   SODB Vol. III for CG's
3. (+) Waste water (MSK 894)
   SODB Vol. III for CG's
4. (-) CM RCS Prop used prior 400K
   (MSK 894)
5. CM RCS System 1 fuel
6. CM RCS System 1 oxidizer
7. CM RCS System 2 fuel
8. CM RCS System 2 oxidizer
(Calculate weights used for burn
SODB Vol. III for CG's)

SSR CONSOLE LOG:
COMPARISONS:

INCLUSIONS:

1. Program inputs 2, 3, 4, 5, 6, 7, 8
2. L/D

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS: Point of contact: Dave Heath, Oliver Hill

CM Prop (lbs) = ΔV ft/sec * 1.78 lbs/ft/sec for CM = 12300.
CM fuel = CM prop./3.
CM ox. = CM fuel * 2
CM fuel 1 = CM fuel 2 = CM fuel/2.
CM ox. 1 = CM ox. 2 = CM ox./2.

Pass ΔX, ΔY, ΔZ to Reentry Support on RETRO request.

MISSION ___Apollo 10_____   DATE ___April 18, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
MASS PROPERTIES Docked Trim Angles	Ted L. Turner, Jr.

	PROGRAM (S) USED:
	Mass Properties Option 005

REQUEST FROM:	DATA PASSED TO:
RETRO	RETRO

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. CSM weight 2. LM weight (total) 3. Ascent stage weight 4. Docking angle (any combination of weights may be input)	Compare trim angles to DMT or external ΔV Lambert Parameters INCLUSIONS: 1. Weights 2. Trim Angles INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Configurations:
CSM
LM
CSM/ASC Docked
CSM/LM Docked
LM/CSM Docked
CG's and both biased and unbiased trim angles are available.
DPS biased trim angles include compliance and drive rates.

PART VIII: MIDCOURSE CORRECTION

Translunar Midcourse

Transearth Midcourse

MISSION __Apollo 10__   DATE __April 25, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Trans-Lunar Midcourse Midcourse Tradeoff Display MSK 79	Ted L. Turner, Jr.
	PROGRAM (S) USED: Midcourse

REQUEST FROM:	DATA PASSED TO:
FIDO MIDCOURSE	FIDO MIDCOURSE

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Vector, REFSMMAT 2. CSM/LM weight 3. CSM dry weight (CSM-SPS) 4. SPS fuel remaining 5. Impulsive G.E.T. 6. Launch Azimuth 7. MCC option 8. MPT information (if desired)	 INCLUSIONS: 1. Program inputs 1, 5, 7, 8 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:
    MCC Options:
    1. X, Y, Z, and T
    2. Free Return Fixed Azimuth
    3. Free Return Free Azimuth
    4. Constrained Circumlunar Flyby
    5. Optimum Circumlunar Flyby
    6. Circumlunar Flyby Scan
    7. Estimated Nodal Targets

MISSION ___Apollo 10_____   DATE _____April 14, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
RETURN TO EARTH (Trans-earth Phase) Optimized Midcourse Abort Scan Table (MSK 362) FDO Mission Plan Table (MSK 47)	Larry D. Davis
	PROGRAM (S) USED: Optimized midcourse

REQUEST FROM:	DATA PASSED TO:
RETRO	RETRO

PROGRAM INPUTS:

1. Moon/earth Centered (MSK 362)
2. Opt. MCC
3. Vector (MSK 362)
4. Impulsive ignition time (MSK 362)
5. Ext. G.E.T. of landing (MSK 362)
6. Target $_y$EI (MSK 362) or Retro
7. Entry downrange (inertial)
8. Entry crossrange

SSR CONSOLE LOG:
COMPARISONS:

Impulsive burn quantities (MSK 362)

INCLUSIONS:

1. Program inputs 2, 3, 4, 6
2. ΔV

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

See detailed notes for explanations.
Opt. MCC recomputes maneuver in analytic node to optimize ΔV.
Nominal entry (relative) downrange is 1285.
Nominal entry (inertial) downrange is 1393.
Nominal entry crossrange is 0.
An RCS maneuver is assumed but on SPS maneuver may be input with no ullage,
tailoff, or buildup.

PART IX: ORBIT GENERAL

Lifetime

K-Factor

Orbit Definition

Checkout Monitor

NORAD Vectors

PFAO

Maneuver Evaluation

Relative Print

Radar Delay Time

Vector for Goldstone

ITT-FEC 47-69   9-2
                    RTACF REQUIREMENT NOTES

MISSION ____Apollo 10____   DATE ____April 30, 1969____

REQUIREMENT:
 	
  Lifetime
 	
  To be supplied at a later date.
	RESPONSIBLE
	RTACF PERSONNEL:
	
	Hector Garcia

	PROGRAM (S) USED:

REQUEST FROM:	DATA PASSED TO:
PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS: INCLUSIONS: INCLUDE: REQUIREMENT, PROGRAM USED
COMMENTS:	

MISSION ___Apollo 10_____   DATE __April 3, 1969_____

REQUIREMENT: K-factor Computation	RESPONSIBLE RTACF PERSONNEL: Hector Garcia, Jr.
	PROGRAM (S) USED: Monitor System Option 04

REQUEST FROM: FDO, RETRO	DATA PASSED TO: FDO, RETRO

PROGRAM INPUTS: 1. 2 vectors over long coast period 2. Area 3. Weight 4. C_D 5. Three K-factor estimates	SSR CONSOLE LOG: COMPARISONS: FDO ORBIT Digitals (MSK 046) INCLUSIONS: 1. Program inputs 1, 2, 3, 4 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

The current RTCC K-factor is displayed on FDO ORBIT DIGITALS display (MSK046) and
CHECKOUT MONITOR display (MSC 1619).

K-factors .75, 1.0 and 1.25 may be good starting points for computation.

RTACF REQUIREMENT NOTES

MISSION ____ Apollo 10 _____   DATE ____ April 9, 1969 _____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Orbit Definition FDO Orbit Digitals (MSK 45 or MSK 46)	Stan D. Holzaepfel

	PROGRAM (S) USED:
	ARRS

REQUEST FROM:	DATA PASSED TO:
FDO, RETRO, GUIDANCE	FDO, RETRO, GUIDANCE

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. Vector 2. K-Factor 3. Vehicle 4. GET of orbit definition	COMPARISONS: Compare H_a and H_p on RTCC display FDO Orbit Displays (MSK 45 or MSK 46) INCLUSIONS: 1. Program inputs 1, 2, 3, 4 2. H_a 3. H_p INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

    Display may be computed either at the GET of the vector or at any input GET.

    Apogee and perigee computations are referenced to the pad radius (earth) or lunar landing sight radius (moon). All other computations as altitude are referenced to an oblate earth or spherical moon.

MISSION ___Apollo 10___   DATE ___April 9, 1969___

REQUIREMENT: Checkout Monitor Checkout Monitor (MSK 1619)	RESPONSIBLE RTACF PERSONNEL: Ted L. Turner
	PROGRAM (S) USED: ARMACR, Monitor System Option 01

REQUEST FROM:	DATA PASSED TO:

PROGRAM INPUTS: 1. Vehicle 2. Vector 3. GET computation	SSR CONSOLE LOG: COMPARISONS: Compare output data with RTCC display check-out monitor (MSK 1619). INCLUSIONS: Program inputs 1, 2, 3 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Monitor system cannot be used to compute checkout monitor other than at vector time.

ARMACR may be used to compute a checkout monitor in either moon sphere or earth sphere regardless of input vector. Display may also be obtained other than at vector time.

ARMACR will not accept an IU vector.

MISSION ____Apollo 10_____   DATE ___April 15, 1969_____

REQUIREMENT: NORAD VECTORS Checkout Monitor (MSK 1619)	RESPONSIBLE RTACF PERSONNEL: Larry D. Davis
	PROGRAM (S) USED: RTCC Checkout Monitor, ARMACR, Monitor System Option 01

REQUEST FROM: Work Schedule	DATA PASSED TO: NORAD - NORAD Loop

PROGRAM INPUTS: 1. Vector 2. G.E.T. of computation	SSR CONSOLE LOG: COMPARISONS: INCLUSIONS: 1. Program inputs 1, 2 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

    Vector is passed every 6 hours or after each maneuver.
    Units are er and er/hr in ECI NMBY system.

    Checkout Monitor from Monitor System may only be obtained at vector time.

RTACF REQUIREMENT NOTES

MISSION ____Apollo 10____   DATE __April 7, 1969__

REQUIREMENT: Postflight Trajectory Data	RESPONSIBLE RTACF PERSONNEL: Stan D. Holzaepfel
	PROGRAM (S) USED: ARMACR

REQUEST FROM: PFAO Work Schedule	DATA PASSED TO: PFAO Simulation Control Room

PROGRAM INPUTS:
 	
  1. Vector
  2. GET of computation
  3. Ullage (if any)
  4. Identification comment
	SSR CONSOLE LOG:
	COMPARISONS:
	
	INCLUSIONS:
	1. Program inputs 1, 2, 3, 4
	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

SPS ignition parameters should reflect any ullage performed. Cutoff times are computed from postburn vectors integrated backward. Trajectory Support Chief will supply ignition and cutoff times.

MISSION ____ Apollo 10 _____   DATE ___ April 9, 1969 ___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Maneuver Evaluation (LM & CSM) Detailed Maneuver Table (MSK 54 or MSK 69)	Stan D. Holzaepfel
	PROGRAM (S) USED: ARMACR/ARRS

REQUEST FROM:	DATA PASSED TO:
FDO	FDO

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Preburn vector 2. Postburn vector 3. REFSMMAT 4. Gimbal angles 5. GETI Maneuver (guess time) 6. Vehicle 7. Thruster specifications 8. Guidance mode	Compare output DMT to RTCC display Detailed Maneuver Table (MSK 54 or MSK 69) **INCLUSIONS:** 1. Program inputs 1, 2, 3, 4 2. External ΔV 3. GETI INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

MISSION ___ Apollo 10 _____   DATE ___ April 7, 1969 _____

REQUIREMENT: Relative Print Relative Motion Digitals (MSK 060)	RESPONSIBLE RTACF PERSONNEL: Stan Holzaepfel
	PROGRAM (S) USED: ARMACR, ARRS

REQUEST FROM: FDO, RETRO	DATA PASSED TO: FDO, RETRO

PROGRAM INPUTS: 1. Vehicle 1 vector 2. Vehicle 2 vector 3. G.E.T. begin and end computation 4. Print interval (for Gimbal Angle Computation only) 5. Active vehicle 6. REFSMMAT 7. Reference axis	SSR CONSOLE LOG: COMPARISONS: Compare curvelinear position and azimuth elevation information on Relative Motion Digitals (MSK 060) INCLUSIONS: 1. Program inputs 1, 2, 3 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Gimbal angle computation is available only in ARRS and then only in Earth or Lunar orbit.

Entry relative print can only be obtained for a constant lift.

This constant lift is obtained from an ARMACR run which iterates on lift to obtained target.

RTACF REQUIREMENT NOTES

MISSION _____ Apollo 10 _____   DATE __ April 2, 1969 __

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Radar Delay Time	Larry D. Davis
	PROGRAM (S) USED: ARMACR

REQUEST FROM:	DATA PASSED TO:
RETRO	RETRO

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Vector 2. Radar Station 3. GET of Delay Time Computation	
	INCLUSIONS: 1. Program Inputs 1, 2, 3 2. Radar Delay Time
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Range from ground site to spacecraft is divided by the speed of light for resultant radar delay time.

MISSION _____ Apollo 10 _____   DATE __April 18, 1969__

REQUIREMENT: Vector for Goldstone	RESPONSIBLE RTACF PERSONNEL: Larry D. Davis
	PROGRAM (S) USED: ARMACR

REQUEST FROM:
 	
  1. As noted in Work Schedule
  2. On Request from "Track"
	DATA PASSED TO:
	
	2 copies to "Track"
	    P-tube station 51

PROGRAM INPUTS:
 	
  1. RTCC vector
  2. Time of true-of-date vector
  3. Maneuvers to be included if any
 	
P-30 and T_{IG} from DMT (MSK 54 or 69)
	SSR CONSOLE LOG:
	COMPARISONS:
	
	Verify time of vector
	
	INCLUSIONS:
	
	  1. Program inputs 1, 2, 3
	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

  1. A vector is passed every 6 hours.
  2. Also a vector is passed at least 2.5 hours before each maneuver. The vector
      should be a cutoff vector for the planned maneuver.

PART X: RADIATION

Radiation Dose

SPAN

MISSION __Apollo 10_____   DATE ___April 7, 1969_____

REQUIREMENT: Radiation Dose	RESPONSIBLE RTACF PERSONNEL: Stan Holzaepfel
	PROGRAM (S) USED: ARMACR/Radiation processor

REQUEST FROM: RADIATION	DATA PASSED TO: RADIATION SSR CONF LOOP

PROGRAM INPUTS: 1. Vector 2. G.E.T. begin and end computation 3. Ephemeris tape frequency (30 sec)	SSR CONSOLE LOG: COMPARISONS: Compare output to RTCC display MSC (1459) INCLUSIONS: 1. Program inputs 1, 2 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Point of contact: Tim White (Radiation), extension 3816.
- Program computes total dose rate and total dosage in both CM and IM.

RTACF REQUIREMENT NOTES

MISSION _____ Apollo 10 _____   DATE _____ April 7, 1969 _____

REQUIREMENT: SPAN Solar Particle Alert Network	RESPONSIBLE RTACF PERSONNEL: Charles E. Allday
	PROGRAM (S) USED: SPAN

REQUEST FROM: RADIATION	DATA PASSED TO: RADIATION - SSR CONF LOOP

PROGRAM INPUTS: 1. One or two paper tapes 2. Input sheet	SSR CONSOLE LOG: COMPARISONS: Requestor will verify output data. Keep copy of input sheet for SSR. INCLUSIONS: 1. GET of request on input sheet.
(Input sheet from Requestor)	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:
    Points of Contact: John Whitler, FCOB, extension 2481
                   Manuel Lopez, SPD, extension 3588
    Program predicts radiation level based on solar flare activity.
    The paper tapes are converted to one or two magnetic tapes by the 418 in Building 12
for use with card input to SPAN program. These tapes are not saved.

    There will be 24 hour turnaround for this requirement.

PART XI: RETROFIRE and REENTRY

Block Data

ARIA Pad

S-IVB LOX Dump

Hybrid Deorbit

SM RCS Deorbit

CLA Deorbit

Ship Arrival and Sight Tracking Data

CM Entry Pointing

Entry Fireball

SM Pointing Data

Entry Relative Print

MISSION _____ Apollo 10 _____   DATE ___ April 15, 1969 _____

REQUIREMENT: Earth Orbit Block Data	RESPONSIBLE RTACF PERSONNEL: Dan Chenoweth Dennis Sager
	PROGRAM (S) USED: Apollo Block Data Processor

REQUEST FROM: RETRO	DATA PASSED TO: RETRO

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:

PROGRAM INPUTS:

PLA
1. Target (Rev, Lat, Long)
2. Deorbit Definition (Attitude, Guidance, Thrust Termination, Ullage)
3. Entry Profile
4. Intermediate Maneuver Definition

APOGEE Deorbits
1. Threshold G.E.T. prior to apogee
2. Thrust Termination
3. Entry Profile

SSR CONSOLE LOG:
COMPARISONS:

INCLUSIONS:
1. Program inputs 2, 3, 4
2. Block number

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Block 1 should be computed prior to liftoff and again with final weight CG data (T-4 hours).
An ARMACR CLA should be run after liftoff for check.
See separation section for separation maneuver.

MISSION __Apollo 10_____   DATE ___April 15, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
ARIA PAD	Larry D. Davis
	PROGRAM (S) USED:
	ARMACR/ARS

REQUEST FROM:	DATA PASSED TO:
RETRO	Track - P-tube 51 SSR FLT DYN 1

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Vector 2. Midcourse maneuver or vector after last MCC	
	INCLUSIONS:
	1. Program input 1, 2
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Special ARIA pad is completed from ARS entry including Greenwich vector at 425K feet from ARMACR.
Pass current aerodynamics from MSK 1620 or ACR printout.
Data should be passed after TEI and at EI - 6 hours.

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10___   DATE ___April 18, 1969___

REQUIREMENT: S-IVB LOX Dump (No SLA Sep Deorbit)	RESPONSIBLE RTACF PERSONNEL: Stan Holzaepfel Bernie Schneider
	PROGRAM (S) USED: ARMACR

REQUEST FROM: RETRO	DATA PASSED TO: RETRO

PROGRAM INPUTS:

1. Texas ACQ + 2 minutes for LOX dump
2. Time for CM burn/or H_A split
3. Vector

SSR CONSOLE LOG:
COMPARISONS:

INCLUSIONS:

1. Program inputs 1, 2, 3

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

S-IVB LOX dump will lower H_p to 80 n.mi., one rev later CM separates and burns 80 fps in hybrid attitude.

Program has iterating capability to hit a longitude on CM burn.
Varying parameter is CM ΔV.

MISSION ___Apollo 10___   DATE ___April 10, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Hybrid Deorbit	Bernie Schneider
	PROGRAM (S) USED:
	GEMMV

REQUEST FROM:	DATA PASSED TO:
RETRO	RETRO

PROGRAM INPUTS:	SSR CONSOLE LOG:
(For Nominal Case)	COMPARISONS:
1. GETI (actual or guess)	
2. REFSMMAT or gimbal angles	
3. SM and CM ΔV's	
4. ΔT coast between burns	
5. Target Lat. and Long.	
6. CM preburn weight	
	INCLUSIONS:
	1. Program inputs 3, 4, 5
	2. Lat. and Long. of landing
	3. GETI
	4. Gimbal angles
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

    This processor also has the capability to perform an ullage or partial SPS burn
    prior to the hybrid deorbit burn. Additional inputs are required.

MISSION __Apollo 10_____   DATE __April 15, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
SM RCS Deorbit Deorbit Digitals (MSK 356)	Larry D. Davis
	PROGRAM (S) USED: ARMACR

REQUEST FROM:	DATA PASSED TO:
RETRO	RETRO

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Vector 2. Maneuver specification (RCS) 3. Entry specification 4. Separation maneuver 5. Target	 INCLUSIONS: 1. Program input 1, 4, 5 2. ΔV INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:
   Nominal RCS maneuver alignment is LVLH angles and External ΔV guidance.
   Nominal entry is lift vector down to 1G and .57 lift to 23.5K.
   See separation section for sep maneuver.

MISSION _____Apollo 10_____   DATE _____April 15, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
CLA Deorbit Deorbit Digitals (MSK 356)	Larry D. Davis
	PROGRAM (S) USED: ARMACR

REQUEST FROM:	DATA PASSED TO:
RETRO	RETRO

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. Vector 2. Maneuver specification (SPS) 3. Entry specification 4. Separation maneuver 5. Target	**COMPARISONS:** Compare maneuver to Deorbit Digital (MSK 356) **INCLUSIONS:** 1. Program inputs 1, 4, 5 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Nominal SPS maneuver alignment is horizon line-of-sight with External $_\Lambda$V guidance.
Nominal entry is lift vector up to .2 G. and .57 lift to 23.5 K.
See separation section for sep maneuver.

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10___   DATE __April 7, 1969__

REQUIREMENT: Ship Arrival and Sight Tracking Data	RESPONSIBLE RTACF PERSONNEL: Larry D. Davis
	PROGRAM (S) USED: ARMACR/ARS

REQUEST FROM: TRACK Work Schedule	DATA PASSED TO: TRACK FLT DYN 1 LOOP or GOSS 6 LOOP

PROGRAM INPUTS: 1. Vector 2. Entry profile 3. Maneuver (if required) 4. Ship position Lat., Long., Alt. 5. Elevation angle = 0 6. Nominal ΔT print = 2 sec.	SSR CONSOLE LOG: COMPARISONS: INCLUSIONS: 1. Program inputs 1, 2, 3, 4 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:
   Confirm ship position with TRACK.
   A maximum of ten stations may be included in ARS radar tracking.
   ARS has pointing capability (site to S/C) of actual entry.

MISSION ____Apollo 10_____   DATE __April 18, 1969___

REQUIREMENT: CM Entry Pointing	RESPONSIBLE RTACF PERSONNEL: Larry D. Davis
	PROGRAM (S) USED: ARM/Work Schedule

REQUEST FROM:

1. Work Schedule
2. On request from Track

DATA PASSED TO:

Track - P-tube station 51

PROGRAM INPUTS:

1. RTCC Vector
2. Radar sites to be used
3. Maneuvers to be included
   (i.e., midcourse)

P-30 ext. ΔV and T_{IG} from DMT (MSK 54 + 69)

SSR CONSOLE LOG:

COMPARISONS:

INCLUSIONS:

1. Program inputs 1, 2, 3

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

MISSION ___Apollo 10_____   DATE __April 18, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Entry Fireball	Larry D. Davis
	PROGRAM (S) USED:
	ARMACR/ARS (detailed printout)

REQUEST FROM:	DATA PASSED TO:
TRACK (Work Schedule)	TRACK P Tube Station 51

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. RTCC Vector 2. Required ARS Input Quantities 3. Request detailed print	
	INCLUSIONS: 1. Program inputs 1, 2
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Fireball is defined to occur when the spacecraft is experiencing a heat rate of at least 100 $BTU/ft^2/sec$. The G.E.T. of begin and end fireball are passed to track.

RTACF REQUIREMENT NOTES

MISSION __Apollo 10__   DATE __April 4, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
SM Pointing Data	Bernie Schneider
	PROGRAM (S) USED: ARMACR/Work Schedule

REQUEST FROM:	DATA PASSED TO:
Work Schedule	Track GOSS 6 LOOP

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. Post-midcourse vector 2. G.E.T. of separation 3. ΔT or ΔV of separation burn 4. Maneuver attitudes 5. Radar stations expected to acquire during SM entry (Station ID, latitude, longitude, altitude) These stations should be determined prior to launch	COMPARISONS: INCLUSIONS: Program inputs 1, 2, 3, 4 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

   At T-8 hours, SM pointing data should be passed to TRACK. Up to 5 radar stations may be input to the work schedule processor per case, however, any number of stations may be processed by stacking the required number of work schedule processor cases in the run. This practice should be avoided whenever possible to prevent excessive run times.

MISSION _____ Apollo 10 _____   DATE __ April 18, 1969 __

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Entry Relative Print Relative Motion Digitals (MSK 060)	Stan Holzaepfel

	PROGRAM (S) USED: ARMACR, ARRS

REQUEST FROM:	DATA PASSED TO:
FDO, RETRO	FDO, RETRO

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
See Orbit General Relative Print	See Orbit General Relative Print INCLUSIONS: INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Entry relative print can only be obtained for a constant lift.
This constant lift is obtained from an ARMACR run which iterates
on lift to obtain target.

PART XII: RENDEZVOUS

Lunar Rendezvous

RTACF REQUIREMENT NOTES

MISSION __Apollo 10__   DATE ____April 25, 1969____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Lunar Rendezvous (To be supplied at a later date)	Larry D. Davis

PROGRAM (S) USED:

ARRS

REQUEST FROM:	DATA PASSED TO:

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS: INCLUSIONS: INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

PART XIII: RETURN TO EARTH/TRANSEARTH INSERTION

RTE AT A Point

RTE Search

RTE Tradeoff

MISSION ___Apollo 10_____   DATE ___April 14, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:

REQUIREMENT:

RETURN TO EARTH (LUNAR/EARTH SPHERE)
   AT A POINT

Abort Scan Table	(MSK 362)
Return to Earth Digitals	(MSK 363)
Return to Earth Target Table	(MSK 366)
FDO Mission Plan Table	(MSK 47)
Elapsed Time Display	(MSK 354)
High Speed Entry Digitals	(MSK 367)

RESPONSIBLE RTACF PERSONNEL:

Larry D. Davis

PROGRAM (S) USED:

GAP/AP/ARMACR/ARS   (LUNAR)
TERRA/ARS   (EARTH)

REQUEST FROM:

RETRO

DATA PASSED TO:

RETRO

PROGRAM INPUTS:

1.	Earth/moon centered	(MSK 362)
2.	Time/Fuel critical	(MSK 362)
3.	ATP/Unspecified area	(MSK 362)
4.	At a point	(MSK 362)
5.	Direction of motion	(MSK 366)
6.	Vector, REFSMMAT	(MSK 362)
7.	Imp/Actual ignition time	
8.	Target line (ATP only)	(MSK 362)
9.	Est. landing time	(MSK 362)
10.	Maneuver specification	(MSK 363)
11.	Target table	(MSK 366)
12.	ARS inputs (MSK 354)	(MSK 367)

SSR CONSOLE LOG:

COMPARISONS:

Impulsive burn quantities	(MSK 362)
Actual burn quantities	(MSK 363)
Entry quantities	(MSK 354, MSK 367)

INCLUSIONS:

1. Program inputs 2, 3, 4, 6, 7
2. ΔV
3. Maneuver code

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS: REFSMMAT (6) and Maneuver specification (10) only needed for RTE and ARS.
ARS is needed for Elapsed times and Entry Digitals (special request). ARIA informa-
tion is obtained from ARS.

ABORT SCAN TABLE CODES:

U.A. - unspecified area
ATP - at a point (targeted) always fuel critical
N - near earth (actually outside lunar sphere)
L - lunar sphere either direction of motion
D - direct (short)
C - circumlunar (long)
FC - fuel critical
TC - time critical
HB1 (constant G) - 2 (steep)
HB2 (G&N) - 1 (shallow)

MISSION __Apollo 10_____   DATE __April 14, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
RETURN TO EARTH (LUNAR SPHERE) SEARCH Tradeoff Display (MSK 364) Abort Scan Table (MSK 362)	Larry D. Davis

PROGRAM (S) USED:

GAP/AP

REQUEST FROM:	DATA PASSED TO:
RETRO	RETRO

PROGRAM INPUTS:

1. Moon centered
2. Fuel critical
3. ATP
4. Search
5. Direction of motion (either)
6. Vector
7. Start & stop G.E.T.
8. Number of points
9. Target line
10. Target table
    (include TZMIN, TZMAX)

SSR CONSOLE LOG:
COMPARISONS:

Tradeoff Display (MSK 364)
Abort Scan Table (MSK 362)

INCLUSIONS:

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Program will compute the time and minimum ΔV of a maneuver to return to target line. The best solution is picked from tradeoff search and displayed in the AST.

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10___   DATE ___April 14, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
RETURN TO EARTH (TRADEOFF) Tradeoff Display (MSK 364)	Larry D. Davis

PROGRAM (S) USED:

GAP/AP, TERRA

REQUEST FROM:	DATA PASSED TO:
RETRO	RETRO

PROGRAM INPUTS:

1. Moon/Earth centered
2. Fuel critical
3. ATP
4. Tradeoff
5. Direction of motion (either)
6. Vector
7. Start and Stop G.E.T.
8. Number of points
9. Target line
10. Target table

(Include TZMIN, TZMAX)

SSR CONSOLE LOG:

COMPARISONS:

RTCC tradeoff display (MSK 364)

INCLUSIONS:

1. Program inputs 3, 4, 6, 7, 8

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Output from GAP/AP is a computer plot of solutions over the given time span.
Output from TERRA is a series of Abort Scan Tables.
Nominal number of points is 40.

PART XIV: SEPARATION

CSM Separation from S-IVB prior to Deorbit

Evasive Maneuver

Post Rendezvous LM/CSM Separation

RTACF REQUIREMENT NOTES

MISSION __Apollo 10__   DATE __April 25, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
CSM Separation from S-IVB Prior to Deorbit (To be supplied at a later date)	Stanley D. Holzaepfel
	PROGRAM (S) USED:

REQUEST FROM:	DATA PASSED TO:

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS: INCLUSIONS: INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

RTACF REQUIREMENT NOTES

MISSION Apollo 10   DATE April 25, 1969

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Evasive Maneuver (To be supplied at a later date)	Stanley D. Holzaepfel

PROGRAM (S) USED:

REQUEST FROM:

DATA PASSED TO:

PROGRAM INPUTS:

SSR CONSOLE LOG:
COMPARISONS:

INCLUSIONS:

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

MISSION _____ Apollo 10 _____   DATE __April 25, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Post Rendezvous LM/CSM Separation (To be supplied at a later date)	Stanley D. Holzaepfel
	PROGRAM (S) USED:

REQUEST FROM:	DATA PASSED TO:

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
	INCLUSIONS:
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

PART XV: CSM SYSTEMS

CSM CRYO-Power Profile

SM RCS Propellant Quantity Remaining

CSM RCS Predicted Propellant Profile

MISSION ___Apollo 10___   DATE __April 2, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
CSM Cryo-Power Profile CSM-ECS-CRYO TAB (MSK 613)	Bill Pruett
	PROGRAM (S) USED: CSM/EPS (SEENA) CSM Cryo - PWR

REQUEST FROM:	DATA PASSED TO:
CSM - ECS	CSM - ECS SSR CONF LOOP

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. Crew activities 2. Equipment usage times 3. Voltages 4. LOADS, etc. (Input sheet from requester)	**COMPARISONS:** Output is CSM electric power profile **INCLUSIONS:** 1. Time span 2. G.E.T. of request on input sheet INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Point of contact: Travis Combs, TRW, extension 3174.

RTACF REQUIREMENT NOTES

MISSION _____Apollo 10_____   DATE ___April 2, 1969___

REQUIREMENT:

SM RCS Propellant
Quantity Remaining Processor
PVT

RESPONSIBLE RTACF PERSONNEL:

Ted L. Turner

PROGRAM (S) USED:

RTACF PVT, Monitor System Option 05

REQUEST FROM:

CSM Propulsion

DATA PASSED TO:

CSM Propulsion - SSR CONF. LOOP, MOCR SYS 1, or PABX 5659

PROGRAM INPUTS:

1. Input sheet.
2. Tank logic is always 3.0 for all 4 quads.
3. Oxidizer and fuel remaining are always 0.0 for all 4 quads.

SSR CONSOLE LOG:
COMPARISONS:

Compare data to CSM SM RCS
Consumables displays
Quads A, C MSK 864
Quads B, C MSK 874

INCLUSIONS:
1. GET of request on input sheet.

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Point of Contact: Orville Hoksch, extension 3981

RCS loading constants (offline data) will be received between T-20 minutes and T+1 hour. Online data will be received on RTACF input sheet.

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10___   DATE ___April 2, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
CSM Systems RCS Predicted Propellant Profile CSM GNC Primary Tab (MSK 683)	Bill Pruett
	PROGRAM (S) USED: CSM/MRS

REQUEST FROM:	DATA PASSED TO:
CSM Propulsion	CSM Propulsion SSR CONF LOOP

PROGRAM INPUTS:	SSR CONSOLE LOG:
Maneuvers, alignments, and/or other fuel uses (Input sheet from requestor)	**COMPARISONS:** Output: CSM RCS budget on a per quad basis. **INCLUSIONS:** G.E.T. of request on input sheet INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

This program will be run on "on call" basis by Travis Combs, TRW.   Phone HU8-3530, extension 3174.

PART XVI: LM SYSTEMS

LM/Power/Water/Oxygen Consumables

LM TM Diagnostics

LM RCS Propellant Consumables

LM DPS Supercritical Helium

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10___   DATE ___April 2, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
LM Power/Water/Oxygen Consumables LM Electric/COM R/T (MSK 1091) LM EECOM R/T (MSK 1001)	Bill Pruett

	PROGRAM (S) USED:
	LM/EPS (SEENA)

REQUEST FROM:	DATA PASSED TO:
LM EPS	LM EPS SSR CONF LOOP

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Battery voltages 2. Equipment loads 3. Switch positions 4. Water and oxygen quantities 5. Usage rates for crew activity and leakage 6. Activity time line	Output: 1. Electrical power profile 2. Water and Oxygen requirements
	INCLUSIONS:
	1. G.E.T. of request on input sheet. 2. Time span of run.
(Input Sheet from Requestor)	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Point of contact: Larry Bradfield, L.E.C., extension 302.

MISSION _____ Apollo 10 _____   DATE _____ April 2, 1969 _____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
LM TM Diagnostic LM Electric/COM R/T (MSK 1091) LM EECOM R/T (MSK 1001)	Bill Pruett
	PROGRAM (S) USED: LM TM Diagnostic

REQUEST FROM:	DATA PASSED TO:
LM COM	LM COM SSR CONF LOOP

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Parameter numbers in any order. These parameters are alpha-numeric with two letters and four numbers. (Input sheet from requester)	Output: LM Electrical failure conditions and locations. INCLUSIONS: 1. Input parameters 2. G.E.T. of request on input sheet INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

    Point of contact: Rod Hugley, L.E.C., extension 310

MISSION ___Apollo 10_____   DATE ___April 2, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
LM RCS Propellant Consumables LM Propulsion R/T (MSK 1125) RCS/APS Consumables Table R/T (MSK 1184)	Bill Pruett
	PROGRAM (S) USED: LM/RCS

REQUEST FROM:	DATA PASSED TO:
LM Consumables	LM Consumables on SSR CONF

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. Maneuvers, alignments, and/or other fuel uses (Input sheet from requester)	Output: LM RCS Budget INCLUSIONS: 1. G.E.T. of request on input sheet 2. Time span of RUN INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

    This program will be run on "on call" basis by Harry Herwig, TRW.
      Phone - HU8-3530, extension 3182

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10_____   DATE __April 2, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
LM DPS Supercritical Helium Pressure LM Propulsion R/T (MSK 1125) RCS/APS Consumables Table R/T (MSK 1184)	Bill Pruett
	PROGRAM (S) USED: LM/SH$_e$

REQUEST FROM:	DATA PASSED TO:
LM Propulsion	LM Propulsion SSR CONF LOOP

PROGRAM INPUTS:	SSR CONSOLE LOG:
1. Temperatures 2. Pressures 3. Weights 4. Thrust profiles (Input sheet from requester)	COMPARISONS: Output: Supercritical He pressure profile and computer print plots. INCLUSIONS: 1. Start and Stop Time of RUN INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

   Point of Contact: Jack Richardson, TRW, extension 2313.

PART XVII: TELESCOPE

World Wide Telescope

Building 16 Telescope

Lick Observatory Telescope

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10_____   DATE __April 10, 1969____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Observatory Telescope Data "World Wide"	Ray Hischke

	PROGRAM (S) USED:
	ARMACR

REQUEST FROM:	DATA PASSED TO:
Work Schedule	Dr. Harold Liemohn Boeing Laboratory Seattle, Washington Phone - 87-206-655-3089

PROGRAM INPUTS:	SSR CONSOLE LOG:

1. G.E.T. Begin, End Computation
2. State Vectors (at most 2 vehicles)
3. Maneuver information
4. Run identification (72 columns)
5. Δt Print
  a. 30 minute during TLC, TEC
  b. 10 minute during lunar orbit
	COMPARISONS:
	
	INCLUSIONS:
	  1. Program inputs 1, 2, 4
	  2. G.E.T. of data passed
	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Punched cards are obtained from ARMACR computer run and sent to Seattle via IBM 066/068 card transceiver in MSC Building 12 (second floor).

Procedures are undeveloped at this time.

MISSION ___Apollo 10___   DATE ___April 25, 1969___

REQUIREMENT: Building 16 Telescope	RESPONSIBLE RTACF PERSONNEL: Larry D. Davis
	PROGRAM (S) USED: ARMACR

REQUEST FROM: Work Schedule	DATA PASSED TO: Andy Saulietis: ext. 3566 off ext. 3457 lab ext. 2185 dome

PROGRAM INPUTS:	SSR CONSOLE LOG:

PROGRAM INPUTS:

1. G.E.T. Begin, End Computation
2. Vector
3. MCC1 or MCC5
4. Δt Print is 30 min.

SSR CONSOLE LOG:
COMPARISONS:

Output is a summary sheet.

INCLUSIONS:

1. Program inputs 1, 2, 3

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Data is to be computed twice during mission, from the evasive maneuver to LOI1 and from TEI to EI.

RTACF REQUIREMENT NOTES

MISSION ___Apollo 10___   DATE ___April 25, 1969___

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Lick Observatory Telescope This requirement has been deleted.	
	PROGRAM (S) USED:

REQUEST FROM:	DATA PASSED TO:

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS: INCLUSIONS: INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

PART XVIII: TRANSLUNAR INJECTION

TLI Burn Monitor & Analysis Plots

TLI Plus 10 Minute Abort

MISSION __Apollo 10_____   DATE _April 15, 1969_____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
TLI Burn Monitor and Analysis Plots	Bill Pruett

	PROGRAM (S) USED:
	TLI - $_\Delta$V - Comparison

REQUEST FROM:	DATA PASSED TO:
FDO, MPAD, Work Schedule	FDO, MPAD (Estes)

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. GMT of liftoff (sec) 2. Time from GRR to liftoff (sec) 3. 9 track telemetry tape of TLI burn (from RTCC) - to be converted to 7 track on 360 in Building 12.	Output: Offline and Cal-Comp plots of TLI velocity differences between the IU and IMU readouts INCLUSIONS: 1. GET of request 2. Initialization times 3. Plot scales 4. Max $_\Delta$V differences INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Dynamics will notify trajectory on FLT-DYN 1 when 9 track tape is ready (expect about one hour after TLI burn). Tape to be picked up at M&O console and taken to Building 12 for conversion to 7 track on the 360.

MISSION __Apollo 10_____   DATE __April 18, 1969____

REQUIREMENT: TLI plus 10 minute abort pitch angle	RESPONSIBLE RTACF PERSONNEL: Larry D. Davis
	PROGRAM (S) USED: TERRA

REQUEST FROM:
 	
  RETRO (Noted in work schedule)
	DATA PASSED TO:
	
	  RETRO

PROGRAM INPUTS:
 	
1. RTCC vector
2. REFSMMAT
3. Specified attitude
  (Nominal attitude is:
  Body pitch = 1° below line of sight
  to far horizon.)
 	
Maneuver will be done with body inplane,
heads-up retrograde
	SSR CONSOLE LOG:
	COMPARISONS:
	
	Compare with Preflight Chart Data
	
	INCLUSIONS:
	
	1. Program inputs 1, 2, 3
	2. ΔV
	3. Gimbal angles
	
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:
1. This RTE computation is made time critical, unspecified area, using
   the specified attitude option of TERRA.
2. The total ΔV and gimbal angles are passed to RETRO.
3. This computation will be made before and after TLI on a high priority
   basis.

PART XIX: WIND DATA

Mode I Abort Horizontal Impact Velocity Component

Prelaunch Mode I Impact Point Prediction

MISSION _____ Apollo 10 _____   DATE _____ April 3, 1969 _____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Mode I Abort Horizontal Impact Velocity Component	Ray Hischke

PROGRAM (S) USED:

SSR Plots

REQUEST FROM:	DATA PASSED TO:
Work Schedule	Flight Director

PROGRAM INPUTS:

1. Peak wind velocities at five tower positions from 500 ft "MET" tower at KSC via MSC Weather Bureau.

SSR CONSOLE LOG:

COMPARISONS:

INCLUSIONS:

1. Altitude (ft) and corresponding peak velocity (knots) for five tower positions.
2. P-Factor.
3. Horizontal Impact Velocity Component (ft/sec).

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

Point of Contact: Sam Newman

"Predicted horizontal impact velocity component based on T-'X' tower reading" passed to Flight Director.   (TRAJ has RETRO ask FD to "meet TRAJ on MOCR DYN.")

MISSION ____Apollo 10____   DATE ____April 2, 1969____

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Prelaunch Mode I Abort Impact Point Prediction	Ray Hischke
	PROGRAM (S) USED:
	Wind Data Processor

REQUEST FROM:	DATA PASSED TO:
Work Schedule	Recovery - Recovery Display Loop

PROGRAM INPUTS:	SSR CONSOLE LOG: COMPARISONS:
1. KSC Wx. Fcst. or KSC Wind Profile 2. Planned launch azimuth	
	INCLUSIONS:
	1. Time of Wx. Fcst. or Balloon Release 2. Type of calculation (EDS or NOM) 3. Onshore, Offshore Beach Crossing Times
	INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

The Trajectory Support Chief should verify balloon releases with Recovery and planned launch azimuth with FDO.

PART XX: WORK SCHEDULE PROCESSOR

Work Schedule Output

Work Schedule Plots

MISSION __Apollo 10__   DATE __April 18, 1969__

REQUIREMENT:	RESPONSIBLE RTACF PERSONNEL:
Work Schedule Output: PSAT, Landmarks, Pointing Data, Closest Approach, Star ACQ and LOSS, Computed Events, Daylight Darkness, Moon Sighting	Hector Garcia, Jr.

PROGRAM (S) USED:

ARMACR/Work Schedule

REQUEST FROM:	DATA PASSED TO:
Flt. Plan Support, FDO	Flt. Plan Support SSR CONF LOOP

PROGRAM INPUTS:

1. Option, Vector, REFSMMAT
2. Landmark numbers on targets
3. Start and End times, Increment
4. Elevation angle

SSR CONSOLE LOG:
COMPARISONS:

Compare: PSAT to MSK 0055

INCLUSIONS:

Include Inputs 1, 2, 3, 4

INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS:

In lunar orbit "moon sighting" data will be earth rise and set. The computed events in lunar orbit will be: Height of Apolune and Perilune referenced to spherical moon, selenographic latitude and longitude of Apolune and Perilune.

MISSION ___Apollo 10___   DATE _April 18, 1969_

REQUIREMENT: Work Schedule Plots	RESPONSIBLE RTACF PERSONNEL: Hector Garcia, Jr.
	PROGRAM (S) USED: ARMACR/Work Schedule

REQUEST FROM: Flt. Plan Support, RETRO Work Schedule	DATA PASSED TO: Flt. Plan Support, RETRO

PROGRAM INPUTS: 1. Start and Stop times, Increment 2. Plot scales 3. Comments for input events 4. Output options 5. Maneuvers included	SSR CONSOLE LOG: COMPARISONS: Compare: PSAT MSK 0055 INCLUSIONS: Include inputs 1, 2, 3, 4, 5 INCLUDE: REQUIREMENT, PROGRAM USED

COMMENTS: Procedure for processing WSP runs: ACR (ACR Chief or LEC programmer) notified Building 12 floor or shift supervisor at X. 4875 that the run will require a plot tape (4060). Deck is usually carried over to Building 12 to avoid confusion. Plot tape is generated when the program is run and then is used to expose the microfilm. The exposed microfilm is developed in Building 12. The ACR will be notified when the film is ready. The film is taken to the Apollo Engineering Microfilm Library, Rm. 125, Building 12 for hardcopy reproduction. Call X. 5825 if hardcopies are to be made between the hours of midnight and 8 a.m. to request the hardcopy machine to be up.